This document contains Appendix C from the 2004 Holland America Oosterdam Data report. Appendix C contains Interview Results for Wastewater Generation Systems, including: Graywater, Pesticides, Special Wastes, Collection, Holding, and Transfer Tanks, Wastewater, and Source Water onboard the Oosterdam for September 14 through September 24, 2004. The report and all the appendices for this sampling event can be downloaded from ***http://www.epa.gov/owow/oceans/cruise_ships/oosterdam.html***

Holland America Oosterdam

2004 Analytical Results

Appendix C

March 2006

Appendix C

INTERVIEW RESULTS FOR ACTIVITIES THAT IMPACT WASTEWATER GENERATION

GRAYWATER GENERATION DATA SHEET

Vessel: Oosterdam
Date: 9/18/04
Recorded By: Donald F Anderson

Vessel Point(s) of Contact: Jan Westerbeek, Environmental Officer (EO)

Number of Passengers and Number of Crew Actually on Board:
Passengers: **1857**
Crew: **768**

Unusual Maintenance or Operational Activities Described By Vessel Point(s) of Contact:
- No major events reported during episode (per EO, Chief Engineer)

Contact for Galleys / food prep, etc.: Mr. Bert Van Mackelenbergh

Number and Time of Meals Served by Day (include passengers and crew) :
- Plan provisions for approx. 4 meals per day; approx. 9,000 total meals per day
- Three large galleys, including crew galley; six large dishwashers; total ~ 12 dishwashers
- Snapshot of number of meals in primary restaurants at this: Vista - 1044; Lido - 475; Pinnacle-120
- From freezer to initial preparation of fish, pork, beef on Deck A; cooking occurs in galleys
- Food pulpers - Scanship
- Main galley provides room service meals
- Bars, (e.g., Crows Nest, etc) - some have small dishwashers
- Galley grills cleaned every day with Grill Shine - lemon juice extract
- Bioclean used to clean hoods (~ weekly), sinks, floors (Absorbit), floor drains (e.g., Hepburn Bio WC Clean,), etc., as needed;
- All chemicals approved by HAL → Approved Chemicals List (ACL)
- Very high / almost "perfect" ratings on recent health inspections; see web site; VERY CLEAN

Breakfast: See above
Lunch: See above
Dinner: See above
Other Meals: See above

Were **Dishwashers** Operated? (Circle one) **Yes** / No
If yes, what weight, number of pieces, or number of loads were washed? Not known

What times were dishes washed by day?
- Operate each day from start of sittings (as necessary) until 3 ½ - 4 hrs after meal sittings

Estimated volume of water per load:
Detergent name (obtain MSDS if available):
- Dishwashing chemicals (per ACL) dispensed automatically in each machine
  - Solid Power; Rinse Dry
- For hand washing, pots/pans, etc - Solitaire, Solid Metal Pro

Contact: Director, Housekeeping; Mr. Tetet Prihatnoko

Was **Laundry** Washed? (Circle one) **Yes** / No

If yes, number of hours per day laundry was operated: ~ 0900 - 2400

- Three large washers - 400 lb capacity (towels; eight loads per day); two medium washers - 125 lb capacity for passenger clothing - number of loads vary; two small washers - 15 lbs capacity (20 loads per day); all machines plumbed directly to GW; six driers
- Crew area - 15 launderette machines; programmed auto-dispense
- Cleaning chemicals used (see summary of primary chemicals from ACL)- Diverdet 2A; Emphasize; Launch; Liquid Diveralk 1C; Renew Extra; Super Impede; Valid II; five of theses chemicals programmed to auto-dispense with input at each machine from one station (20 L containers w/ small dike)
- Dry cleaning
  - one self-contained machine (Rinzacci) w/ no drain to GW; perc used and distilled / recycled; condensate collected and off-loaded for shore disposal as HW (Victoria); small dike
  - one small spotting machine - steam, air, limited perc, w/ no drain GW; small dike; any residual to HW
- Liquid waste: waste perc plus other liquid waste and sludge - ~ 20L pail monthly

Estimated volume of water per load:
Weight, number of pieces, or number of loads washed per day: Not known
Are there floor drains in the laundry? Yes, but overflow only. What and where do they drain? GW
Laundry area is VERY CLEAN, well maintained
Detergent and other chemicals names (obtain MSDS if available): All major MSDSs obtained; see above
Other Sources (e.g., small pantries, steward stations, cleaning stations): NA
Times these sources are generated: Various, not fixed
Estimated volume per source: Various, not fixed
Cleaning urinals, etc. - e.g., Limeaway
Handwashing - e.g., Revive Hand Soap
Floor washing, etc - Absorbit; see also chemicals from ACL, MSDSs

SPECIAL WASTES GENERATION AND DISPOSITION DATA SHEET

Vessel: Oosterdam
Date: 9/18/04
Recorded by: Donald F Anderson

Photo Lab(s) On Board: yes or no (circle one)

- Observed with and briefed by Photo Lab manager, George Romanian, with EO

For each of the above areas, describe the following:

Waste handling and disposition:

- Non-hazardous w/ silver recovery from SRU cartridges by vendor; cartridges last ~ 600 hrs; one primary, one backup; on-shore vendor refunds value of recovered silver w/in ~ 6 wks
- Observed chemical test of cartridge reject stream; test clearly showed less than hazardous concentration of Silver; thus Non-HW; documentation by EO

Any waste treatment (e.g., silver recovery in photo lab)? What is the disposition of treated waste and any residuals (e.g., silver recovery filter and filtrate)?

- Less developer chemical used for two digital developing machines, compared to analog film developing machines, but more concentrated; rags, etc., contribute to ship's total of ~ 1 ½ barrels / month of HW
- See HAL Hazardous and Solvent Waste Management Manual - MR 703

Inspect area for floor drains. Are drains blocked or open? Where do the floor drains lead? Describe any streams that enter the floor drains.

- Two floor drains are blocked; floor drain outside room can be diked if there is a big spill occurs

Inspect area for sinks. Is sink drain blocked or open? What is the disposition of sink water? What streams enter or potentially the sink (e.g., hand washing, rinse/clean equipment, prepare chemical solutions)?

- Yes, but NOT connected to GW; connected to chemical recovery cartridge (see above); HAL - no chemical disposal policy

Inspect area for chemical storage. Are chemicals stored over a sump or other secondary containment?

- Limited chemical storage tanks with digital developing machines; starter, developer, stabilizer, replenisher, etc.; from Approved Chemicals List (ACL)
- MSDSs present for list of approved chemicals used
- Very clean and well kept room

Print Shop(s) On Board: **yes** or no (circle one)

- Observed with and briefed by Print Shop manager

For each of the above areas, describe the following:

- One offset printer, three copiers, one laser

Waste handling and disposition:
- Rags, any residual chemicals, etc., off-loaded in Victoria, BC as HW for disposal
- Toner cartridges are recycled through onshore vendors

Any waste treatment (e.g., silver recovery in photo lab)? What is the disposition of treated waste and any residuals (e.g., silver recovery filter and filtrate)?
- None; rags, residuals taken off in Seattle as HW for disposal

Inspect area for floor drains. Are drains blocked or open? Where do the floor drains lead? Describe any streams that enter the floor drains.
- Yes, at door, but no spills to date

Inspect area for sinks. Is sink drain blocked or open? What is the disposition of sink water? What streams enter or potentially the sink (e.g., hand washing, rinse/clean equipment, prepare chemical solutions)?
- Yes; two, for hand washing only

Inspect area for chemical storage. Are chemicals stored over a sump or other secondary containment?
- Locker for cleaning solvents, offset printing chemicals (e.g., alcohol, deglazer, plate etch, etc.); PPE available for flammable cleaning solvents, other chemicals; MSDSs available
- Appears to be clean and well kept

Dry Cleaning On Board: **yes** or no (circle one) See Table 3-2 for details

Chemical Storage Area On Board: **yes** or no (circle one)
- Observed with and briefed by EO

For each of the above areas, describe the following:

Chemical handling and disposition:
- A number of storage areas in various locations within main Engine Room (ER) / engineering spaces
- Small storage closets in a few shops - wood, metal working - machine shop, maintenance shops, etc
- Generally, all stores observed in ER and other nearby decks / locations are well organized and well kept, good signs, many have shelves w/ bars to keep containers from falling; MSDSs available, PPE where necessary
- Generally, alkaline, acid, neutral chemicals are segregated and many have some secondary containment; a few small stores have polypropylene spill catchment containers (PP - recycle code 5)
- In main ER, chemical stores are within water tight compartments (WTC) with bilges that are pumpable should there be an accidental spill
- Most chemicals used asserted to be on Approved Chemicals List (ACL - HAL; e.g., housekeeping, etc.); generally appears to be true
- See HAL Hazardous and Solvent Waste Management Manual - MR 703

Examples of chemical stores observed, some with some secondary containment
- WTC - potable water treatment area
  - Sodium hypochlorite (chlorination); large plastic / resin carboys ~ 260 gals
  - Sodium meta-bisulfite (dechlorination); partially covered since can be unstable when
- WTC 2 - Synthetic refrigerant oils, high temperature soot blowing and diesel turbocharger lubes, misc. lubes, cutting oils, degreasers, tank cleaners, antifreeze (glycol), etc
- Center hall, fwd - storage of bottled refrigerant gas (freon), various housekeeping / bathroom sanitizer / cleaning chemicals; materials staged for off-loading and HW, Non-HW disposal, etc

Any waste treatment (e.g., silver recovery in photo lab)? What is the disposition of treated waste and any residuals (e.g., silver recovery filter and filtrate)?
- No; see above regarding pumpable WTCs / bilges

Inspect area for floor drains. Are drains blocked or open? Where do the floor drains lead? Describe any streams that enter the floor drains.
- See above regarding pumpable WTCs / bilges
- Stores in rooms observed not in ER / engineering spaces did not have drains

Inspect area for sinks. Is sink drain blocked or open? What is the disposition of sink water? What streams enter or potentially the sink (e.g., hand washing, rinse/clean equipment, prepare chemical solutions)?
- Sinks generally not near chemical stores, with possible exception of small shops not observed

Medical Infirmary / Dental Care On Board: yes or no (circle one)

- Observed with and briefed by chief nurse - Susan Mamaric, and Karen Moran

For each of the above areas, describe the following:

Waste handling and disposition:

- Machine cleaning chemical residuals, rags, outdated medications, screened residual amalgam, etc., off loaded in Seattle as HW

Any waste treatment (e.g., silver recovery in photo lab)?

- None
- Small volume cleanup wastewaters to GW
- Sewage from toilets to BW

What is the disposition of treated waste and any residuals (e.g., silver recovery filter and filtrate)?

- No wastewater discharged, aside from normal cleaning wastewater to GW; digital Xray imaging
- Any cleanup rags, etc., to off-shore disposal as HW

Inspect area for floor drains. Are drains blocked or open? Where do the floor drains lead? Describe any streams that enter the floor drains.

- Pantry - goes to GW
- No other floor drains

Inspect area for sinks. Is sink drain blocked or open? What is the disposition of sink water? What streams enter or potentially the sink (e.g., hand washing, rinse/clean equipment, prepare chemical solutions)?

- Pantry sink to GW
- Autoclave/sanitizing machine, sinks in examining rooms to GW

Inspect area for chemical storage. Are chemicals stored over a sump or other secondary containment?

- Digital imaging; very small volume cleaning chemicals, no developing chemicals, any cartridges recycled, etc
- Very clean, well kept as it should be

Garbage Room On Board: **yes** or no (circle one)

For each of the above areas, describe the following:

Waste handling and disposition:

- Room is refrigerated, no treatment, only solid / wet waste separation / crushing equipment
- Extensive recycling with hand separation of all garbage (e.g., glass, aluminum and tin cans, box board, wet garbage; flourescent tubes, batteries for separate disposal, etc)

Any waste treatment (e.g., silver recovery in photo lab)? What is the disposition of treated waste and any residuals (e.g., silver recovery filter and filtrate)?

- Three drains to bilge and oil / water separator (OWS), one drain to GW
- All liquid waste is non-hazardous
- Screening for separation, food waste (Scanship), etc

Inspect area for floor drains. Are drains blocked or open? Where do the floor drains lead? Describe any streams that enter the floor drains.

- Two drains to bilge and oil / water separator (OWS)

Inspect area for sinks. Is sink drain blocked or open? What is the disposition of sink water? What streams enter or potentially the sink (e.g., hand washing, rinse/clean equipment, prepare chemical solutions)?

- One sink next to sorting table, for hand washing only

Inspect area for chemical storage. Are chemicals stored over a sump or other secondary containment?

- Hazardous chemical locker with no drains; MSDSs available

PESTICIDE, FUNGICIDE, AND RODENTICIDE USE DATA SHEET

Vessel: Oosterdam
Date: 9/18/04
Recorded by: Donald F Anderson

Contact: Director, Housekeeping; Mr. Tetet Prihatnoko

Pesticides Used On Board: yes or **no** (circle one)

- Use only citronella
- Relatively new ship, no significant cockroach issues

List Locations Where Pesticides are Normally Applied and Stored On Board and Dates Applied:

Potential to Enter Graywater/Blackwater Systems (e.g., application, spills, floor drains)?

Person(s) Responsible for Pesticide Application:

Fungicides Used On Board: yes or **no** (circle one**)**

List Locations Where Fungicides are Normally Applied and Stored On Board and Dates Applied:

Potential to Enter Graywater/Blackwater Systems (e.g., application, spills, floor drains)?

Person(s) Responsible for Fungicide Application:

Rodenticides Used On Board: yes or **no** (circle one)

List Locations Where Rodenticides are Normally Applied and Stored On Board and Dates Applied:

Potential to Enter Graywater/Blackwater Systems (e.g., application, spills, floor drains)?

Person(s) Responsible for Rodenticide Application:

COLLECTION, HOLDING, AND TRANSFER (CHT) TANK DATA SHEET

Vessel: Oosterdam
Date: 9/18/04
Recorded by: Donald F Anderson

Contacts: Engineering staff - Dan, Dave, Camille, Adrian

Tank Number or Identification: See VSSP for complete listing of holding and double bottom (DB) tanks for blackwater and graywater system; see also copies of blueprints of ship's tankage provided by EO in lieu of VSSP

Wastewater Source(s):
Tank Volume:_____ m^3 or gallons
Does the Tank Have Vacuum: yes or no (circle one):
Vacuum: ____ mm Hg
Tank Material of Construction:
Is this a double bottom tank: yes or no (circle one)
Normal Operating Volume: _____ m^3

Automated Tank Gauging and Discharge System: **yes** or no (circle one)
- radar sounding with direct connection to engineering control room

Discharge Type: batch or continuous (circle one)
Totalizer or Flow Meter on Discharge Line: yes or no (circle one)
Discharge Flow Rate: _____ m^3/min or m^3/day
Wastewater Destination After Leaving the Tank:
Approximate Diameter of Discharge Line: _____ inches
Screens or Filters Present on Either Influent or Discharge Lines (describe):
Chemical Additions to Tank:

Chemical Name	Purpose	Amount	MSDS (yes/no)

Is sludge removed from this tank (describe frequency, amount, destination)?:

WASTEWATER TREATMENT UNIT DATA SHEET

Vessel: Oosterdam
Date: 9/18/04
Recorded by: Donald F Anderson

Contacts: Engineering staff - Dan, Dave, Camille, Adrian

Description of Treatment Unit:

- GW: Sweco vibrating screen / solids filter, RO (ROCHEM), UV; permeate combines w/ permeate-UV treated wastewater from BW system to overboard discharge; concentrate to BW system
- BW and galley: Sweco filter, very small two-stage aeration chambers / biological reactors, RO (ROCHEM), UV; permeate-UV treated wastewater w/ permeate-UV treated wastewater from GW system to overboard discharge

Manufacturer: ROCHEM based system for GW and BW
Model: NA
Design Drawings Obtained: **yes** or no (circle one) simplified, not detailed

Design Capacity: GW: ~650 m^3/day; BW: ~330 m^3/day
Typical Operating Flow Rate: GW: ~19 m^3/min; BW: ~10-11 m^3/min; ~240-264 m^3/day
Operational period: 24 hrs; 7 days /wk

Chemical Additions:

Chemical	Amount	Units	MSDS Obtained
Caustic	10 L/wk		
Hydrochloric acid			
Anti-scale agent	10 L/wk		Yes - Rhobib - 52

Electrical Requirements:
Volts: 400 Amps: 60 Horsepower: various sizes, many pumps

Sludge Generation: **yes** or no (circle one)
If yes, describe frequency, amount, and destination:

- Diagram shows 2 - 3 m^3/day

Was maintenance performed on treatment unit: yes or no (circle one) If maintenance was performed, estimate labor: _____ hours

- None noted by engineering staff; AMOS used for normal scheduled preventive maintenance and repairs as-needed
- ROCHEM membranes treated w/ B100 every ~600 hrs, or when pressure drop of 5 bars reached

List operating parameters recorded (e.g., flow, temperature, pressure, pH), typical values, and range for this unit. Record or obtain copy or printout of logs for the duration of the sampling episode.

- RO - 5 bar pressure drop, then automatic clean cycle; membranes soaked sequentially in Rochem A-225 alkaline cleaner and Rochem B-100 acid cleaner, then flushed to combine with waste biosludge; discharged outside 12 nm
- Control room system monitors effluent flow rate, DO concentrations, reactor TSS (MLSS; measured as turbidity), conductivity, pH, operating temperature, sludge flow rates, UV, feed pressures
- Operating difficulties with periodic structural failures of ABS piping; crew has requested HAL to replace ABS with stainless steel to reduce structural failures and maintenance demands
- Bag filters for screened solids (~4/day; ~150/mo) inefficient
- Operating cost of chemicals is high

SOURCE WATER DATA SHEET

Vessel: Oosterdam
Date: 9/18/04
Recorded by: Donald F Anderson

Contacts: Engineering staff - Dan, Dave, Camille, Adrian

Is Potable Water Generated On Board the Vessel: **yes** or no (circle one)
Describe the On-Board Potable Water Treatment and Disinfection Method:

- Two sets of evaporators with six effects each; 650 m3/day each set; total of 1,300 m^3/day
- 400 m^3/day may be bunkered from municipal water sources at ports if necessary; however this is done very infrequently
- Total capacity, if necessary, 1,700 m^3/day

Port (City) Where Source Water is Obtained if Not Generated On Board:

- Victoria, Skagway, Juneau, Ketchikan

Treatment Method for Source Water Obtained in Port:

- See publicly available sources for cities / water supplies noted above

Disinfection Method for Source Water Obtained in Port:

- PHS-based method: Checked for E. coli; Hypochlorite added to ~2 ppm, retested after 24 hrs, if residual hypo equal to or greater than 3 ppm, OK, if not water is dumped

Fluoride Added to Water Obtained in Port: yes or **no** (circle one) - typically, but see web sites for cities

Additional Disinfection Performed On Water Obtained in Port: yes or **no** (circle one)

Describe Additional On-Board Disinfection Method: None

Description of Source Water Sample Collection Point On Board Cruse Ship:

- See SAP for Oosterdam and sampling team notes for sample taken during episode #6505
- Crew: various - at supply tanks and ends of piping runs on upper decks, per PHS requirements